MATHS

BOOKS - ML KHANNA

HEIGHTS AND DISTANCES

Problem Set 1 Mcq S

1. The angle of elevation of the top of a tower from a point 20 metres away from its base is 45°. The height of the tower is

A. 10 m

B. 20 m

C. 40 m

D. $20\sqrt{3}$

Answer: B

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2. At a point 15 metres away from the base of a 15 metres high house, the angle of elevation of the top is

A. 45°

B. 30°

C. 60°

D. 90°

Answer: A

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3. From the top of a light house 60 m high with its base at sea level the angle of depression of aboat

is 15°. The distance of the boat from the light house is

A. $\left(\frac{\sqrt{3}-1}{\sqrt{3}+1}\right)60m$

B. $\left(\frac{\sqrt{3}+1}{\sqrt{3}-1}\right)60m$

C. $\left(\frac{\sqrt{3}-1}{\sqrt{3}+1}\right)^2 m$

D. None

Answer: B

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4. The angle of elevation of the sun when the length of the shadow of a pole is $\sqrt{3}$ times the height of the pole is

A. 30°

B. 45°

C. 60°

D. 15°

Answer: A

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5. The angle of elevation of the top of an incomplete vertical pillar at a horizontal distance of 100 m from its base is 45°. If the angle of elevation of the top of the complete pillar at the same point is to be 60°, then the height of the incomplete pillar is to be increased by

A. $50\sqrt{2}$m

B. 100 m

C. $100\left(\sqrt{3}-1\right)$ m

D. $100\left(\sqrt{3}+1\right)$ m

Answer: C

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6. The angle of elevation of the top of a T.V. tower from three points A,B,C in a straight line in the horizontal plane through the foot of the tower are $\alpha, 2\alpha, 3\alpha$ respectively. If AB=a, the height of the tower is

A. $a \tan \alpha$

B. $a \sin \alpha$

C. $a \sin 2\alpha$

D. $a \sin 3\alpha$

Answer: C

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7. The angle of elevation of the top of a certain tower from a point A on the ground is α, at B is 2α, at C is 3α. If $AB = \frac{4}{3}BC$, then which of the following is true.

A. $\sin\alpha = \sqrt{\frac{5}{12}}$

B. $\cos\alpha = \sqrt{\frac{5}{12}}$

C. $\sin\alpha = \frac{3}{4}$

D. $\cos\alpha = \frac{3}{8}$

Answer: A

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8. The angles of depression of two points A and B on a horizontal plane such that AB= 200 from the top P of a tower PQ of height 100 are $45 - \theta$ and $45 + \theta$. If the line AB Passes through Q the foot of the tower, then angle θ is equal to

A. 45°

B. 30°

C. 22.5°

D. 15°

Answer: C

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9. An aeroplane flying at a height of 300 m above the ground passes vertically above another plane at an instant when the angles of elevation of two planes from the same point on the ground are

60° and 45°, respectively. What is the height of the lower plane from the ground?

A. $100\sqrt{3}$

B. $100/\sqrt{3}$

C. 50

D. $150\left(\sqrt{3}+1\right)$

Answer: A

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10. ABCD is a square plot. The angle of elevation of the top of a pole stading at D from A or C is 30° and that from B is θ, then $\tan\theta$ is equal to

A. $\sqrt{6}$

B. $1/\sqrt{6}$

C. $\sqrt{3}/2$

D. $\sqrt{2}/3$

Answer: C

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11. A tree is broken by wind, its upper part touches the ground at a point 10 metres from the foot of the tree and makes an angle of 45° with the ground . The entire length of the tree is

A. 15 m

B. 20 m

C. $10\left(1+\sqrt{2}\right)m$

D. $10\left(1+\sqrt{2}/2\right)m$

Answer: C

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12. The angle of elevation of the top of a tower standing on a horizontal plane from a point A is α . After walking a distance d towards the foot of the tower, the angle of elevation is found to be β. The height of the tower is

A. $\frac{d \sin \alpha \sin \beta}{\sin(\beta - \alpha)}$

B. $\frac{d \sin \alpha \sin \beta}{\sin(\alpha - \beta)}$

C. $\frac{d \sin(\beta - \alpha)}{\sin \alpha \sin \beta}$

D. $\frac{d \sin(\alpha - \beta)}{\sin \alpha \sin \beta}$

Answer: A

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13. AB is a vertical pole with B at the ground level and A at the top. A man finds that the angle of elevation of the point A from a certain point C on the ground is $60o$. He moves away from the pole along the line BC to a point D such that $CD = 7m$. From D the angle of elevation of the point A is $45o$. Then the height of the pole is (1) $\frac{7\sqrt{3}}{2}\frac{\dot{1}}{\sqrt{3}-1}m$ (2) $\frac{7\sqrt{3}}{2}\dot{\sqrt{3}}+1m$ (3) $\frac{7\sqrt{3}}{2}\dot{\sqrt{3}}-1m$ (4) $\frac{7\sqrt{3}}{2}\frac{\dot{1}}{\sqrt{3}+1}m$

A. $\frac{7\sqrt{3}}{2}\frac{1}{\sqrt{3}-1}m$

B. $\frac{7\sqrt{3}}{2}(\sqrt{3}+1)m$

C. $\frac{7\sqrt{3}}{2}(\sqrt{3}-1)m$

D. $\frac{7\sqrt{3}}{2}\frac{1}{\sqrt{3}+1}m$

Answer: B

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14. A man from the top of a 100 metres high tower observes a car moving towards the tower at an angle of depression of 30°. After some time, the angle of depression becomes 60°. The distance (in metres) travelled by the car during this time is

A. $100\sqrt{3}$

B. $\frac{200\sqrt{3}}{3}$

C. $\frac{100\sqrt{3}}{3}$

D. $200\sqrt{3}$

Answer: B

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15. At a point on a level plane subtends an angle θ and flag staff of height a at the top of the tower subtends an angle ϕ. Find the height of the tower.

A. $\frac{a \sin\theta \cos\phi}{\cos(\theta+\phi)}$

B. $\frac{a \sin\phi \cos(\theta+\phi)}{\sin\theta}$

C. $\frac{a \cos(\theta+\phi)}{\sin\theta \sin\phi}$

D. None

Answer: B

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16. A vertical pole PS has two marks at Q and R such that the portions PQ, PR and PS subtend angles α, β, γ at a point on the ground distant x

from the pole. If PQ=a, PR=b,PS=c and $\alpha + \beta + \gamma = 180^\circ$, then $x^2 =$

A. $\frac{a}{a+b+c}$

B. $\frac{b}{a+b+c}$

C. $\frac{c}{a+b+c}$

D. $\frac{abc}{a+b+c}$

Answer: D

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17. The shadow of a tower is found to be 60 ft. longer when the sun's altitude has become 60° from 30°. The height of the tower from the ground is

A. 350 ft. app.

B. 400 ft. app.

C. 51 ft. app.

D. None

Answer: C

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18. An observer standing on a 300 m high tower observes two boats in the same direction, their angle of depression are 60° and 30° respectively. The distance between the boats is

A. 173.2 m

B. 346.4 m

C. 25 m

D. 72 m

Answer: B

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19. The angle of elevation of the top of two vertical towers as seen from the middle point of the line joining the foot of the towers are 60° and 30° respectively. The ratio of the heights of the tower is

A. $2:1$

B. $\sqrt{3}:1$

C. $3:2$

D. $3:1$

Answer: D

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20. Two towers stand on a horizontal plane. P and Q where PQ = 30 m, are two points on the line joining their feet. As seen from P the angle of elevation of the tops of the towers are 30 and 60 but as seen from Q are 60 and 45. The distance between the towers is equal to

A. $15\left(4+\sqrt{3}\right)m$

B. $15\left(4-\sqrt{3}\right)m$

C. $15\left(3+\sqrt{3}\right)m$

D. $15\left(2+\sqrt{3}\right)m$

Answer: A

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21. Two vertical poles of height a and b subtend the same angle 45° at a point on the line joining their feet, the square of the distance between their tops is

A. $(h+H)^2$

B. $2\left(h^2+H^2\right)$

C. h^2+H^2

D. $\frac{1}{2}\left(h^2+H^2\right)$

Answer: B

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22. Two vertical AL and BM of heights 20 m and 80 m respectively and stand apart on a horizontal plane. If A, B be the feet of the poles and AM and BL intersect at P, then the height of P is equal to

A. 50 m

B. 18 m

C. 16 m

D. 15 m

Answer: C

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23. Angle of depression from the top of a light house of two boats are 45° and 30° due east which are 60 m apart. The height of the light house is

A. $60\sqrt{3}$

B. $30\left(\sqrt{3}+1\right)$

C. $30\left(\sqrt{3}-1\right)$

D. None

Answer: C

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24. PQ is a part of a given height a and AB is a tower at some distance, α and β are the angles of elevation of B, the top of the tower at P and Q respectively. The height of the tower is

A. $\frac{a \sin \alpha \sin \beta}{\sin(\alpha - \beta)}$

B. $\frac{a \cos \alpha \cos \beta}{\sin(\alpha - \beta)}$

C. $\frac{a \sin \alpha \cos \beta}{\sin(\alpha - \beta)}$

D. None

Answer: C

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25. A ladder rests against a vertical wall at angle α to the horizontal . If is foot is pulled away from the wall through a distance 'a' so that it slides a

distance 'b' down the wall making the angle β with the horizontal , then a =

A. $a = b \tan\frac{\alpha+\beta}{2}$

B. $a = b \cot\frac{\alpha+\beta}{2}$

C. $a\frac{\tan(\alpha-\beta)}{2}$

D. None

Answer: A

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26. A man on a cliff observes a boat at an angle of depression 30° which is sailing towards the shore to the point immediately beneath him. Three minutes later the angle of depression of the boat is found to be 60°. Assuming that the boat sails at a uniform speed, determine how much more time it will take to reach the shore.

A. 2 min

B. $1\frac{1}{2}$ min

C. 1 min

D. None

Answer: B

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27. A chimeny of 20 m height standing on the top of a building subtends an angle whose tangent is $\frac{1}{6}$ at a distance of 70 m from the foot of the building, then the height of building is

A. 50 m

B. 40 m

C. 60 m

D. None

Answer: A

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28. If a flag staff subtends the same angles at the points A,B,C and D on the horizontal plane through its foot, the points A,B,C and D from a

A. square

B. cyclic quadrilateral

C. rectangle

D. None

Answer: B

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29. PQ is a vertical tower having P as the foot. A,B,C are three points in the horizontal plane through P. The angles of elevation of Q from A,B,C are equal and each is equal to θ . The sides of the triangle ABC are a,b,c, and area of the triangle ABC is . Then prove that the height of the tower is (abc) $\frac{\tan\theta}{4}$.

A. $(abc)\tan\theta/4\Delta$

B. $(abc)\cot\theta/4\Delta$

C. $(abc)\sin\theta/4\Delta$

D. None

Answer: A

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30. A pole stands at the centre of a rectangular field and it subtends angles of 15° and 45° at the mid-points of the sides of the field. If the

length of its diagonal is 1200 m, then the height of the flag staff is

A. 400 m

B. 200 m

C. $300\sqrt{2-\sqrt{3}}m$

D. $300\sqrt{2}-\sqrt{3})m$

Answer: c

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31. A pole stands vertically , inside a triangular park $\triangle ABC$. If the angle of elevation of the top of the pole from each corner of the park is same, then in $\triangle ABC$ the foot of the pole is at the

A. centroid

B. circumcentre

C. incentre

D. orthocentre

Answer: D

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32. A and B are two points in the horizontal plane through O,, the foot of a pillar OP of height h such that $\angle AOB = \theta$. If the elevation of the top of the pillar from A and B are also equal to θ, then AB is equal to

A. $h \cot \theta$

B. $h \cos \theta \sec \frac{\theta}{2}$

C. $h \cot \theta \quad \sin \frac{\theta}{2}$

D. $h \cos \theta \operatorname{cosec} \frac{\theta}{2}$

Answer: B

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33. A tower stands at the centre of a circular park . A and B are two points on the boundary of the park such that AB(=a) subtends an angle of 60° at the foot of the tower , and the angle of elevation of the top of the tower from A or B is 30°. The height of the tower is

A. $\frac{2a}{\sqrt{3}}$

B. $2a\sqrt{3}$

C. $\frac{a}{\sqrt{3}}$

D. $a\sqrt{3}$

Answer: C

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34. A flag-staff 20 m long standing on a wall 10 m high subtends an angle whose tangent is 0.5 at a point on the ground. If θ is the angle subtended by the wall at this point, then

A. $\tan\theta = 1$

B. $\tan\theta = 1/3$

C. $\tan\theta = 3$

D. $\tan\theta = 1/2$

Answer: A::B

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35. A tower subtends an angle of 30° at a point on the same level as the foot of the tower. At a second point h metre above the first, the depression of the foot of the tower is 60°. The horizontal distance of the tower from the point is

A. $h\cot 60^\circ$

B. $\frac{1}{3}h\cot 30^\circ$

C. $\frac{h}{3}\cot 60^\circ$

D. $h\cot 30^\circ$

Answer: A::B

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36. The angle of elevation of the top of the tower observed from each of three points A,B , C on the ground, forming a triangle is the same angle α. If R is the circum-radius of the triangle ABC, then find the height of the tower R $\tan\alpha$.

A. $R \sin \alpha$

B. $R \cos \alpha$

C. $R \cot \alpha$

D. $R \tan \alpha$

Answer: D

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37. A flag staff of 5m high stands on a building of 25m high. At an observer at a height of 30 m. The flag staff and the building subtend equal angles .

The distance of the observer from the top of the flag staff is

A. $\frac{5\sqrt{3}}{2}$

B. $5\sqrt{\frac{3}{2}}$

C. $5\sqrt{\frac{2}{3}}$

D. None

Answer: B

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38. From the top of a cliff of height 'a' the angle off depression of the foot of a certain tower is found to be double the angle of elevation of the top of the tower of height h. if θ be the angle of elevation then its value is

A. $\cos^{-1}\sqrt{\frac{2h}{a}}$

B. $\sin^{-1}\sqrt{\frac{2h}{a}}$

C. $\sin^{-1}\sqrt{\frac{a}{2-h}}$

D. $\tan^{-1}\sqrt{3-\frac{2h}{a}}$

Answer: D

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39. If a flag-staff 6 metres high placed o the top of a tower throws a shadow of $2\sqrt{3}$m along the ground, then the angle (in degrees) that the sun makes with the ground is

A. 60°

B. 30°

C. 45°

D. None

Answer: A

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40. The top of a hill observed from the top and bottom of a building of height h is at angles of elevation α and β. respectively. The height of the bill is

A. $\frac{h\cot\beta}{\cot\beta-\cot\alpha}$

B. $\frac{h\cot\alpha}{\cot\alpha-\cot\beta}$

C. $\frac{h\tan\alpha}{\tan\alpha-\tan\beta}$

D. None

Answer: B

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41. The angles of elevation of a cliff at a point A on the ground and a point B, 100 m vertically above A are α and β respectively. The height of the cliff is

A. $\frac{100\cot\alpha}{\cot\alpha-\cot\beta}$

B. $\frac{100\cot\beta}{\cot\alpha-\cot\beta}$

C. $\frac{100\cot\beta}{\cot\beta-\cot\alpha}$

D. $\frac{100\cot\beta}{\cot\beta+\cot\alpha}$

Answer: C

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42. The angle of elevation of a cloud from a point h m above the level of water in a lake is α and the angle of depression of its reflection in the lake is β. Then the height of the cloud above the water level is

A. $\frac{h\sin(\beta-\alpha)}{\sin(\beta+\alpha)}$

B. $\frac{h\sin(\beta+\alpha)}{\sin(\beta-\alpha)}$

C. $\frac{h\sin(\alpha+\beta)}{\sin(\alpha+\beta)}$

D. None

Answer: B

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43. On the level ground, the angle of elevation of a tower is 30°. On moving 20 m nearer, the angle of elevation is 60°. The height of the tower is

A. 10 m

B. 20 m

C. $10\sqrt{3}m$

D. None

Answer: C

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44. A person standing on the bank of a river observes that the angle subtended by a tree on the opposite of bank is 60° . when he returns 40 m from the bank, he finds the angle to be 30°. What is the breadth of the river?

A. 40 m

B. 60 m

C. 20 m

D. 30 m

Answer: C

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45. A tower subtends an angle α at a point in the plane of its base and the angle of depression of the foot of the tower at a point b ft. just above A is β. Then , height of the tower is

A. b tan $\alpha \cot \beta$

B. $b \cot \alpha \tan \beta$

C. $b \tan \alpha \tan \beta$

D. $b \cot \alpha \cot \beta$

Answer: A

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46. From an aeroplane vertically over a straight horizontal road, the angles of depression of two consecutive milestones on opposite sides of the aeroplane are observed to be α and β. The height of the aeroplane above the road is

A. $\frac{\tan\alpha + \tan\beta}{\tan\alpha \tan\beta}$

B. $\frac{\tan\alpha \tan\beta}{\tan\alpha + \tan\beta}$

C. $\frac{\cot\alpha \cot\beta}{\cot\alpha + \cot\beta}$

D. None

Answer: B

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47. Each side of an equilateral triangle subtends an angle of 60° at the top of a tower hm high located at the centre of the triangle. It a is the

length of each side of the triangle, then prove that $2a^2 = 3h^2$.

A. $3a^2 = h^2$

B. $a^2 = 3h^2$

C. $2a^2 = 3h^2$

D. $3a^2 = 2h^2$

Answer: C

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48. ABC is a triangular park in the form of an equilateral triangle. A pillar at A subtends an angle of 45°. If θ be the angle of elevation of the pillar at D, the middle point of BC, then $\tan\theta$ is equal to

A. $\frac{\sqrt{3}}{2}$

B. $\frac{2}{\sqrt{3}}$

C. $\sqrt{3}$

D. $\frac{1}{\sqrt{3}}$

Answer: B

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49. Each side of a square subtends an angle of 60° at the tip of a tower of height h metres standing at the centre of the square. If I is the length of each side of the square, then what is h^2 equal to ?

A. $3a^2 = 2h^2$

B. $2a^2 = 3h^2$

C. $2h^2 = a^2$

D. $h^2 = 2a^2$

Answer: C

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50. AB is a vertical pole. The end A is on the level ground .C is the middle point of AB. P is a point on the level ground . The portion BC subtends an angles β at P. If AP = nAB, then tan β=

A. $\frac{n}{n^2-1}$

B. $\frac{n}{n^2+1}$

C. $\frac{n}{2n^2+1}$

D. None

Answer: C

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Problem Set 1 True And False

1. The angle of elevation of a stationary cloud from a point 2500m m above a lake is 15° and the angle of depression of its image in the lake is 45°. The height the cloud above the lake level is

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2. From a light house the angle of depression of two ships on opposite sides of the light house are observed to be 30° and 45°. If the height of the light house be 100 metres, then the distance between the ships of the line joining them passes through the foot of the light house is $100\left(\sqrt{3}-1\right)$.

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3. From the top of a spire the angle of depression of the top and bottom of a tower of height h are θ and ϕ respectively. Then the height of the spire and its horizontal distance from the tower are respectively $\frac{h\cos\theta\sin\phi}{\sin(\theta+\phi)}$ and $\frac{h\cos\theta\cos\phi}{\sin(\theta+\phi)}$

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4. The angular depressions of the top and the foot of a chimney as seen from the top of a second chimney which is 150 meters high and standing on the same level as the first are θ and ϕ

respectively. Find the distance between their tops, when $\tan\theta = \frac{4}{3}, \tan\phi = \frac{5}{2}$.

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5. The height of a house subtends a right angle at the opposite street light. The angle of elevation of light from the base of the house is 60°. If the width of the road be 6 meters, then the height of the house is

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6. A vertical tower stands on a horizontal plane and is surmounted by a vertical flag staff of height h. at a point P on the plane, the angle of elevation of the bottom of the flag staff is β and that of the top is α, then the height of the tower is

$$\frac{h\tan\beta}{\tan\alpha\tan\beta}.$$

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7. What should be the height of a flag where a 20 feet long ladder reaches 20 feet below the flag

(The angle of elevationof the top of the flag at the foot of the ladder is 60° ?

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8. The angle of elevation of the top of a tower which is incomplete at a point 120 ft. from its base is 45°. If the elevation at the same point of the top is desired to be 60° then the tower should be raised by $120\left(\sqrt{3}-1\right)$ ft.

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9. A ladder leaning against a vertical wall is inclined at an angle α to the horizontal. The top of the ladder touches the parapet. On moving its foot 'a' feet away from the wall, the ladder now stands inclined at an angle β to the horizon and its top now touching a window. then the distance of the parapet from the window is a $\cot\frac{\alpha+\beta}{2}$.

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10. A vertical tower 50ft high stands on a sloping groud. The foot of the tower is at the same level

as the middle point of a vertical flag pole. From the top of the tower the angle of depression of the top and the bottom of the pole are 15° and 45° respectively. Find the length of the pole.

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11. Two pillars of height a and b subtend the same angle α at a point on the line joining their feet. If the pillars subtend angles β and γ at another point in the horizontal plane at which the line joining their feet subtends a right angle then $(a+b)\cot^2\alpha = a^2\cot^2\beta + b^2\cot^2\gamma$

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Problem Set 1 Fill In The Blanks

1. The angle of elevation of a cloud from a point h mt. above is θ° and the angle of depression of its reflection in the lake is ϕ. Then, the height is

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2. The width of a road is b feet. On one side of which there is a window h feet high. A building in

front of it subtends an angle θ at it, then the height of the building is____

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3. The angle of elevation of the top of a pillar at any point A on the ground is 15°. On walking 100 ft. towards the pillar, the angle becomes 30°. Height of the pillar and its distance from A are ____and____respectively.

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4. The angle of elevation of a tower from a point on the same level as the foot of the tower is 30^0. On advancing 150 metres towards the foot of the tower, the angle of elevation of the tower becomes 60^0. Show that the height of the tower is 129.9 metres (Use $\sqrt{3} = 1.732$).

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5. The angle of elevation of the top of a tower at a point A on the ground is 30°. On walking 20 meters toward the tower, the angle of elevation is

60°. Find the height of the tower and its distance from A.

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6. The height f a chimney when it is found that on walking towards it 100 ft. in a horizontal line through its base the angular elevation of its top changes from 30° to 45° is___

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7. The shadow of a tower standing on a level ground is found to be 60 metres longer when the sun's altitude is 30° than when it is 45°. The height of the tower is____

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8. A man in a boat rowed away from a cliff 150 m high takes 2 min, to change the angle from 60° to 45°. The speed of the boat is

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9. An aeroplane flying horizontally , 1km above the ground , is observed at an elevation of 60° ,after 10 seconds , its elevation is observed to be 30° . Find the speed of the aeroplane in km/hr.

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10. The angle of elevation of the top and bottom of a flag staff fixed at the top of a tower at a point distant 'a' ft. from the foot of the tower are α and β. The height of the tower is____

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11. From the top of a cliff 200 ft. high, the angles of depression of the top and bottom of a tower are observed to be 30° and 60° respectively. The height of the tower is____

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12. A balloon moving in a straight line passes vertically above two points A and B on a horizontal plane 1000 ft. apart, when above A it has an altitude of 60° as seen from B when above B it has an altitude of 45° as seen from A. the

distance of A from the point at which it will touch the plane is _____

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13. A balloon moving in a straight line passes vertically above two points A and B on a horizontal plane 1000 ft. apart. When above A it has an altitude of 60° as seen from B and when above B 30° as seen from A. the distance from A of the point at which it will touch the plane is_____

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14. A vertical pole (more than 100 ft. high) consists of two portions the lower being $\frac{1}{3}$rd of the whole. If the upper portion subtends an angle $\tan^{-1}\frac{1}{2}$ at a point in a horizontal plane through the foot of the pole and distance 40 ft. from it, then the height of the pole is _____

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15. The angles of elevation of the top of a tower standing on a horizontal plane from two points on a line passing through the foot of the tower at

distances a and b respectively are complementry angles. If the line joning the two points subtend an angle θ at the top of the tower then $h =$ ____and $\sin\theta =$ ____.

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16. A tower of x metres height has flag staff at its top. The tower and the flag staff subtend equal angles at a point distant y metres from the foot of the tower. Then, the length of the flag staff in metres is

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17. A wireless pole 25 metres high is fixed on a top of a verandah of a house which is 15 metres high. At a point R on the ground, directly opposite, the wireless pole and verandah subtend equal angles. The distance of R from the verandah is____

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18. A round balloon of radius 'r' subtends an angle α at the eye of the observer, while the angle of

elevation of its centre is β. Find the height of the centre of balloon.

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19. A stationary balloon is observed from three points A, B and C on the plane ground and is found that its angle of elevation from each of these points is α, if $\angle ABC = \beta$ and $AC = b$, the height of the balloon is___

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20. From the top of a pole of height h, the angle of elevation of the top of the tower is α. The pole subtends an angle β at the top of the tower. The height of the tower is____

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21. A tower subtends an angle α at a point in the plane of its base and the angle of depression of the foot of the tower at a point b ft. just above A is β. Then , height of the tower is

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Problem Set 2 Mcq S

1. A mean observes that when he moves up a distance c metres on a slope, the angle of depression of a point on the horizontal plane from the base of the slope is 30^0, and when he moves up further a distance c metres, the angle of depression of that point is 45^0. The angle of inclination of the slope with the horizontal is.

A. 60°

B. 75°

C. 70°

D. None

Answer: B

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Problem Set 2 True And False

1. Two stations due south of a leaning tower which leans towards the north are respectively at distance x and y from its foot $(y > x)$. If α and β be the elevations of the top of the tower from

these stations and θ is inclination of the tower to the horizontal then $\cot\theta$ equals

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2. A tree standing on a horizontal plane is leaning towards East. At two points situated at distances a and b exactly due West of it, the angle of elevation of the top are respectively α and β. Height of the top from the ground is

$$\frac{(b-a)\tan\alpha\tan\beta}{\tan\alpha+\tan\beta}$$

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3. A chimney leans towards North. At equal distances due north and south of it in a horizontal plane the elevation of the top are α, β. The inclination of the chimney to the vertical is

$\tan^{-1}\dfrac{\sin(\alpha-\beta)}{2\sin\alpha\sin\beta}$

or $\tan^{-1}\dfrac{1}{2}(\cot\beta-\cot\alpha)$

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4. A flag leaning towards East is inclined at an angle θ to the level ground. A man walks a distance l from the foot of the flag towards West

and observes the angle of elevation of the top of the flag to be α. On walking further distance l_1 in the same direction, the angle of elevation is decreased by β, then

$$\tan\theta = \frac{l_1}{(l+l_2)\cot\alpha - l\cot(\alpha-\beta)}$$

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Problem Set 2 Fill In The Blanks

1. A train is moving at a constant rate at an angle θ East of North. Observations of the train are made from a fixed point. It is due north at some

instant. Ten minutes earlier its bearing was α_1 West of North whereas ten minutes afterwards its bearing α_2 East of North, then $\tan\theta =$ ____.

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Problem Set 3 Mcq S

1. ABC is a triangular park with AB+AC=100 m. a clock tower is situated at the mid-point of BC. The angles of elevation of the top of the tower at A and B are $\cot^{-1} 3 \cdot 2$ and $\operatorname{cosec}^{-1} 2 \cdot 6$ respectively. The height of the tower is

A. 16 m

B. 25 m

C. 50 m

D. None

Answer: B

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2. A vertical tower stands on a declicity which is inclined at 15° to the horizon. From the foot of the tower a man ascends the declivity for 80 feet

and then finds that the tower substends an angle of 30° . The height of the tower is

A. $20\left(\sqrt{6}-\sqrt{2}\right)$

B. $40\left(\sqrt{6}-\sqrt{2}\right)$

C. $40\left(\sqrt{6}+\sqrt{2}\right)$

D. None

Answer: B

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3. A tower PQ of height h subtends an angle of 45° at a point A on the horizontal plane. At another point B on AB inclined to horizontal at angle of 30°, the elevation of top of the tower is found to be 60°. If AB=a„ then

A. $a = h\left(\sqrt{3}+1\right)$

B. $a = h\left(\sqrt{3}-1\right)$

C. $h = a\left(\sqrt{3}+1\right)$

D. $h = a\left(\sqrt{3}-1\right)$

Answer: B

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4. From a point on a horizontal plane, the elevation of the top of a hill is 45°. The elevation becomes 75° after walking a distance of 500 m up a slope of inclined at an angle of 15° to the horizon. The height of the hill is

A. $500\sqrt{6}$

B. $500\sqrt{3}$

C. $250\sqrt{6}$

D. $250\sqrt{3}$

Answer: C

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5. At each end of a horizontal base AB of length 2a the angular height of a certain peak is 15° and that at the mid-point C of base AB it is 45°. The height of the peak is

A. $\frac{\sqrt{3}-1}{6}a$

B. $\frac{\sqrt{3}-1}{6}3^{3/4}a$

C. $\frac{3-\sqrt{3}}{2}a$

D. $\frac{\sqrt{3}-1}{2\sqrt{3}}a$

Answer: B

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6. The angle of elevation of a certain peak when observed from each end of a horizontal base line of length 2a is found to be θ. When observed from the mid-point of the base the angle of elevation is ϕ. The height of the peak is

A. $\frac{a}{\sqrt{(\cos\theta - \cos\Psi)}}$

B. $\frac{a}{\sqrt{(\cot^2\theta - \cot^2\Psi)}}$

C. $\frac{a}{\sqrt{(\cos^2\theta - \cos^2\Psi)}}$

D. None

Answer: B

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Problem Set 3 True And False

1. A person stands at a point A due south of a tower and observes his elevation is 60°. He then

walks westwards towards B where the elevation is 45°. At a point C on AB produced he finds it to be 30°, then AB=2BC.

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2. An object is observed from three points A,B,C in the same horizontal plane passing through the base of the object. The angle of elevation at B is twice and at C is thrice that at A. if AB=a, BC=b, then the height of the object is $\frac{a}{2b}\sqrt{(a+b)(3b-a)}$.

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3. A man observes a tower AB of height h from a point P on the ground. He moves a distance d towards the foot of the tower and finds that the angle of elevation is doubled. He further moves a distance "$\frac{3d}{4}$ in the same direction and finds that the angle of elevation is three times that of at the point P .then (A) $30h^2 = 35d^2$ (B) $35h^2 = 36d^2$ (C) $36h^2 = 35d^2$ (D) $36h^2 = 35d^2$

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4. A balloon is observed simultaneously from three points A, B and C on a straight road directly under it. The angular elevation at B is twice and at C is thrice that at A . If the distance between A and B is 200 metres and the distance between B and C is 100 metres, then find the height of balloon above the road.

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5. DE is a tower standing on a horizontal plane and ABCD is a straight line in the plane. The

height of the tower substends an angle θ at A, 2θ at B and 3θ at C. if AB and BC be respectively 50 metres and 20 metres then the height of the tower and the distance CD are $\frac{25}{2}\sqrt{7}$m and 17.5 m.

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6. The top of a tower is observed from three point A,B,C on a straight line leading to the tower. If the angles of elevation are θ, 2θ, 3θ from them, then $\frac{AB}{BC} = \frac{\cot\theta - \cot 2\theta}{\cot 2\theta - \cot 3\theta}$

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7. The angle of elevation of the top of a tower at a point A due south of the tower is α and at β due east of the tower is β. If AB=d, then height of the tower is

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8. Three points A,B,C are in a line inclined at an angle θ to the horizon of three points. A is the lowest and C is highest. D is a point vertically above C. if

$AB = p, CD = q, \angle DAB = \alpha$ and $\angle DBC = \beta$

, then

$$\cos\theta = \frac{p\sin\alpha\cos\beta}{q\sin(\beta - \alpha)}$$

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9. Top of a mountain is observed from A and B at the sea level. If N is the point vertically below P and

$\angle NAB = \alpha, \angle NBA = \beta, \angle NAP = \theta, \angle NBP = \phi$

, then $\tan\phi\sin\beta = \tan\theta\sin\alpha.$

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10. A man observes two objects in a straight line in the West. On walking a distance c to the north, the objects subtend an angle α in front of him and on walking a further distance c to the north, they subtend an angle β. Then the distance between the objects is

$$\frac{3c}{2\cot\beta - \cot\alpha}.$$

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11. A man notices two objects in a straight line due West after walking a distance c due North he

observes that the objects subtend an angle α at his eye and after walking a further distance 2c due north, they subtend an angle β. Then the distance between the objects is

$$\frac{8c}{3\cot\beta - \cot\alpha}.$$

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Problem Set 3 Fill In The Blanks

1. A man observes that when he has walked c metres up an incline, the angular depression of an object in a horizontal plane through the foot of

the slope in α, and when he has walked a further distance of c metres the depression is β. The inclination of the slope to the horizon is _____.

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2. A tower is observed from two stations A and B where B is East of A at a distance 100 metres. The tower is due North of A and due North-West of B. the angles of elevation of the tower from A and B are complementary, the height of the tower is_____.

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3. The elevation of a tower due North of a station A is α and at another station B due West of A it is β. The height of the tower is _____.

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4. The angle of elevation of a tower at a place due south of it is θ and at a place due west of A and at a distance 'a' from it, the elevation ϕ. The height of the tower is _____.

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5. PQ is a tower standing on horizontal plane, Q being its foot. Two points A and B are taken on the plane such that AB=21 and (c) QAB is a right angle. It is found that cot PAQ=2/5 and cot PBQ=3/5, then the height of tower is ____.

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6. A flag staff PN stands upright on a level ground. A base AB is measured at right. Angle to AN such that points A,B,N lie in the same horizontal plane.

If $\angle PAN = \alpha$ and $\angle PBN = \beta$, then height of flag staff is _____.

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7. The angle of elevation of the top of a tower from a point A on the ground is θ and that from B is ϕ. If AB=100 metres and AB is perpendicular to the line joining A with the foot of the tower, then the height of the tower is _____ (given $\cot\theta = 3/10, \cot\phi = 1/2$)

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8. The angle of elevation of a tower at point A due north of it is 30° and at another point due East of A is 18°. If AB=a, then the height of the tower is_____.

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9. A vertical pole stands at a point O on a horizontal ground. A and B are points on the ground d metres apart. The pole subtends angles α and β at A and B respectively. AB subtends an angle at O. the height of the pole is _____.

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